DOCUMENT RESUME

ED 291 583 SE 048 915

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TITLE Student Knowledge of Health and Fitness Concepts and Its Relation to Locus of Control.
PUB DATE Apr 88
NOTE 19p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (61st, Lake of the Ozarks, MO, April 10-13, 1988).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Concept Formation; Curriculum Development; Grade 8; Grade 9; *Health Education; Individual Power; Junior High Schools; *Locus of Control; *Physical Health; Science Curriculum; Science Education; *Science Instruction; *Secondary School Science
IDENTIFIERS *Science Education Research

ABSTRACT

Most school curricula include the study of health as a separate subject or as part of science. Despite this, students often leave school without a clear understanding of many health concepts. This study investigated a group of grade eight and nine students' knowledge of personal health and physical fitness concepts and its relation to locus of control. A 20 item true-false knowledge questionnaire with opportunities for students to explain their choice indicated that while students scored relatively well on the items the explanations of their responses frequently indicated erroneous reasoning based on preconceptions or misconceptions. Students' locus of control was measured using two instruments for health and fitness respectively and showed that this sample had a higher expectation of control by themselves for their fitness compared to their health. Correlation data between knowledge and locus of control scores indicated that students who possessed high knowledge scores had a tendency not to believe in chance for their personal health and physical fitness. Conversely students who possessed low knowledge scores had more of a tendency to believe in chance for their personal health and physical fitness. The study comments on the success of the health education curriculum and offers suggestions for further research. (Author)

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STUDENT KNOWLEDGE OF HEALTH AND FITNESS CONCEPTS AND ITS RELATION TO LOCUS OF CONTROL

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SE 049 915

Paper presented at the annual conference of the National Association for Research in Science Teaching, Lodge of the Four Seasons, Lake Ozark, Missouri, April 10-13, 1988.

STUDENT KNOWLEDGE OF HEALTH AND FITNESS CONCEPTS AND ITS RELATION TO LOCUS OF CONTROL

Most school curricula include the study of health as a separate subject or as part of science. Despite this, students often leave school without a clear understanding of many health concepts. This study investigated a group of grade 8 and 9 students' knowledge of personal health and physical fitness concepts and its relation to locus of control. A 20 item true-false knowledge questionnaire with opportunities for students to explain their choice indicated that while students scored relatively well on the items the explanations of their responses frequently indicated erroneous reasoning based on preconceptions or misconceptions. Students' locus of control was measured using two instruments for health and fitness respectively and showed that this sample had a higher expectation of control by themselves for their fitness compared to their health. Correlation data between knowledge and locus of control scores indicated that students who possessed high knowledge scores had a tendency not to believe in chance for their personal health and physical fitness. Conversely students who possessed low knowledge scores had more of a tendency to believe in chance for their personal health and physical fitness. The study comments on the success of the health education curriculum and offers suggestions for further research.

INTRODUCTION

Health is an essential component of a happy life. With improved medical practices the probability of surviving youthful diseases and living many years beyond retirement is growing stronger. To enjoy this longer, healthier life, people must learn to survive the enticements of junk food, the hazards of excessive drinking and smoking, as well as a myriad of other threats to their well-being. Besides the individual benefits to be gained by proper health and fitness practices there are numerous societal benefits. The costs of medical insurance and hospital services have increased alarmingly in the last few years. Any inroads into this growing problem would pay handsomely for the individual, the employer, the insurer and the government. Indeed the health insurance agencies have recognized the calamity that looms ahead if health habits are not changed. Many companies are actively encouraging enrollment in new health maintenance organizations that emphasize wellness rather than sickness. Subsequently, those companies design health coverage accordingly since they hope to entice subscribers into utilizing programs that promote health and fitness rather than paying the costs that stem from their clients neglect of their bodies' needs.

In her review of health education and science education, Garrard (1986) writes that science teachers are involved in health education in two ways: Through the incorporation of health-related topics within general science and biology curricula and through the teaching of health education as a separate subject. Most school curricula include the study of health, incorporating the topic in both science and physical education programs (Pollack and Hamburg, 1985). Yet, despite these school curricula to which they are exposed, students often leave school without a clear understanding of many health concepts (Health Education Council, 1982; Peers and Christie, 1984; Skinner and Woodburn, 1984; and Weinberg, Carbonari and Laufman, 1984).

According to Garrard (1986), health education research can be differentiated into two broad but interacting categories: Descriptive/ explanatory research and interventionist research. The work described here falls into the first category and blends with a constructivist learning model (Pines and West, 1986). In examining theories of learning, Novak (1977) emphasized the need to identify students' conceptual knowledge and beliefs early in instruction, and then to use this information in choosing subsequent strategies and materials for student learning experiences. Research indicates that students often hold beliefs about science topics that are incongruent with accepted principles and theories. Strike and Posner (1982) and Williams (1981) suggest that learning is more likely to occur when instruction is centered on diagnosing and correcting misconceptions or improper preconceptions. In health education, there are few research studies that have used the constructivist model of learning. In a review of health education research, Rothman and Byrne (1981) stress the need for concerted efforts to provide a research base for decision making in health instruction. Brumby, Garrard and Auman (1985) report that while there is a paucity of misconception research in health education, some studies show students to hold a wide range of beliefs concerning health.

In investigating students' perceptions about control of their health, Wallston and Wallston (1978) reported that many concepts which students believed were important to their health and lifespan were also held to be beyond their personal control. Consequently, students need to see the relevance of learning about health and fitness and they need to accept a large measure of the responsibility for their personal well-being. Indeed, Maddock (1983) reports that students' attitudes toward health and their awareness of health issues are not highly correlated. Of equal concern is Kolbe's (1985) findings that while students' knowledge, attitudes and skills concerning health are consistently improved through school health education

programs, health behaviours are seldom influenced. Among likely factors influencing this lack of understanding of health concepts and principles is a sense of lack of control over this aspect of their lives. Indeed, students often see relevant others as responsible for much of their education, their recreation, and their growth (Newman, 1984). Students also tend to confuse the learning of knowledge in health education with a true understanding of the topic and how they should be personally involved in directing their own health programs (Veenker, 1985). Garrard (1986) suggests that 'healthy' health educators are those who can successfully integrate learning about health and fitness and learning to perform according to what they learn. Garrard also reports that assertiveness training is being added to health education by some teachers in the hopes of bridging the gap between knowledge and practice.

PROBLEM

This study investigated the conceptual knowledge and locus of control of students in health education classes in secondary schools in Western Australia. Specifically two research questions were used to provide guidance for the study: What is the status of student knowledge regarding personal health and physical fitness concepts? and, How do students view their locus of control over personal health and physical fitness related practices?

METHODS

Sample

The grades 8 and 9 (aged 13-14 years) students involved in this study attended regular health education classes in two metropolitan Perth senior high schools, each with a population of more than one thousand students. Neither school has a selective admission policy and students are drawn from the surrounding area. Twenty two students from grades 8 and 9 were

interviewed and 109 students from grade 8 (n = 53) and grade 9 (n = 56) responded to the pencil and paper tests.

Health Education Curriculum

Health education programs include many components related to total human well-being. Russell (1981) uses a wellsprings model to illustrate what he calls positive holistic health. The wellsprings include nutritional balance, exercise, mental/emotional balance, heredity, human/spiritual interaction, and ecological balance. In the Western Australian syllabus, health education is an umbrella term that encompasses all the components listed by Russell, though not necessarily using the same terms. In Western Australia, health education is a formal part of the school curriculum and is taught by health education teachers as a separate subject though 41% of Australian secondary health education teachers come from a science teaching background (Laird [cited in Gerrard, 1986]). The Health Education Syllabus for Years K-10 (Education Department of Western Australia, 1986) is taught in all health education classes throughout secondary schools in Western Australia and involves a spiral curriculum which addresses aspects of food groups, diet, eating habits, exercise, nutrition, fitness, and life-style related diseases in greater detail as students progress through grades 4-10. As with all health education programs the aim is to establish habits that will be personally profitable (better personal health and physical fitness) and publicly less costly (fewer medical problems). Personal health (nutrition) and physical fitness (exercise) are the components of health education addressed in this study.

Instrumentation

Data for this study were gathered using interviews and a variety of pencil and paper measures.

Student conceptual knowledge was obtained initially from from interviews with grades 8 and 9 students from two schools in Perth, Western Australia, to identify preconceptions, misconceptions, and areas where knowledge about personal health and physical fitness was consistent or inconsistent with the concepts included in the Health Education Syllabus for Years K - 10 (Education Department of Western Australia, 1986). Using semi-structured interviews, the researchers talked with groups of three or four students and discussion was encouraged on the following questions: What does it mean to you to be healthy?; How would you go about finding out who was the fittest person in your grade?; Why do we want to control our weight?; What does it mean to you when someone says they are going on a diet? The interviews were tape-recorded and transcribed verbatim. The wide range of responses was tallied to identify the most common misunderstandings, preconceptions and misconceptions.

The interviews provided a range of useful data upon which to construct a questionnaire comprising twenty true/false items with opportunity for students to provide a written reason for their response. Consequently, the Health and Fitness Questionnaire contained 20 items which focussed on personal health concepts, fitness concepts and interrelations between health and fitness concepts. Specifically, these concepts and the number of the item from the test involved:

Personal Health: energy balanced diet [item 2]; dietary intake and being overweight [7]; good eating habits and advertising [8]; loss of weight through not eating [12]; balance between protein foods and fruits/ vegetables/cereals [13]; salt in the diet [14]; alcohol and sugar in the diet [15]; going on a diet to loose weight [18].

Physical Fitness: cardiovascular fitness and physical activity [3]; health fitness and diseases [6]; regular exercise programmes [9]; benefits of regular exercise [10]; fitness and physical wellbeing [19]; fitness and exercise [20].

Health and Fitness: Meaning of healthy and being fit [1]; food intake, body size and activity [4]; eating, exercise and health maintenance [5]; weight control not affected by exercise only by food intake [11]; health and sport [16]; overweight and lack of fitness [17].

Two True/False items illustrating each of the three categories are shown below. Personal health items (number shown in parentheses) were: (2) An energy-balanced diet provides the right number of joules (calories) needed to build and maintain teeth and bones; (14) For many people, large amounts of salt in the diet have been linked with the development of high blood pressure. Physical fitness items were: (3) A person with good cardiovascular fitness can run further and work longer with less effort; (9) Regular exercise for 15-20 minutes a day, three or more times per week, can help keep you physically fit. Health and fitness items were: (1) Being healthy and being fit are the same; (11) Weight control is not affected by physical exercise, it is all a matter of overeating.

Student's locus of control was identified from two instruments modified from the Multidimensional Health Locus of Control (MHLC) Scale (Wallston and Wallston, 1978). One instrument, Health Locus of Control, measured students' beliefs about the amount of control they have over their personal health. The second instrument, Fitness Locus of Control, provided data on student's beliefs about the amount of control they have over their physical fitness. The latter instrument was based on items included in the Wallstons' study but was modified to stress fitness rather than health.

While personal health and physical fitness are related terms they were each considered separately in this aspect of the study. Each locus of control instrument was composed of eighteen items. The Health Locus of Control test was designed to examine how strongly students felt about the control of their health in terms of themselves (I [internal] HLC), powerful others (PHLC) or if their health was largely controlled by chance (CHLC). A parallel format was used for the Fitness Locus of Control instrument. Six items were purposefully written for each of these three control forces and students responded on a six point Likert Scale from Strongly Disagree (1) to Strongly Agree (6). All three scales were scored such that high scores were interpretted as indicating high expectations of control by the source designated. Examples of Internal items on the Health & Fitness locus of control respectively were : 'If I become sick I have the power to make myself well again' and 'If I become unfit I can control how soon I become fit again'. Examples of the Powerful Others items were: 'I can only maintain my health by consulting health professionals' and 'Whenever I am unfit I should consult with a trained fitness professional (such as my PE teacher)'. Examples of Chance items were: "Even when I take care of myself it is easy to get sick" and "No matter what I do, I'm not likely to become fit".

Data from the locus of control instruments for health and fitness were used with student conceptual knowledge scores to investigate the two research questions identified earlier; the relationship between student knowledge and locus of control also was examined.

RESULTS AND DISCUSSION

Health and Fitness Questionnaire

From the 20 items of this questionnaire and from the interviews upon

which the items were based, a number of misunderstandings about the concepts involved in the Health Education curriculum were identified. Since there were no statistical differences ($t = 0.90$) between knowledge scores of the grade 8 and 9 groups, the percentage of the combined group of students with correct responses on each item are presented in Table 1. On only six items of this conceptual knowledge instrument, which had a Cronbach alpha reliability of 0.66, did more than 75% of students provide correct answers. Many students confused being personally healthy with being physically fit (Item 1, 52% correct) and thought that being healthy is related to sports, recreation and doing things better (Item 16, 7% correct). Many students believed that being fit meant not being overweight (Item 17, 67% correct) and related fitness to big muscles and running without breathlessness. Students did not appear to know of different kinds of fitness and believed that to keep healthy one needs to exercise. Students knew they should eat properly and exercise in order not to develop certain health problems (Item 5, 95% correct) but most did not have regular exercise programs.

Many students know what junk foods are and that they should avoid eating them in excess (Item 8, 62% correct). However, given a choice of a candy bar or an apple, most would choose the candy bar. In spite of this, they know that excess sugars and fats in their diets are harmful to them (Item 7, 66% correct). While they know about a balanced diet in terms of the five food groups, they do not know if they are eating according to that prescribed balance and leave that responsibility to their parents. Most students did not know about cardiovascular fitness and some think that running out of breath is losing all their energy (Item 20, 75% correct): however, they had no knowledge of cellular metabolism. Many students believed that diets are exclusively for losing weight (Item 18, 51% correct) but others knew about diets, fad diets and that all people do not need the same diet (Item 4, 85% correct).

Locus of Control Instruments

The Health Locus of Control (HLC) and Fitness Locus of Control (FLC) instruments comprised three scales representing three factors of health and fitness locus of control beliefs respectively, namely Internality; Powerful Others and Chance. Descriptive statistics (Table 2) for the HLC and FLC instruments are presented for the combined group of grade 8 and 9 students since on only one scale, Powerful Others HLC, was there a significant difference between grade 8 and 9 scores ($t = 2.44$, $p < 0.05$). The Cronbach alpha reliabilities of the three HLC scales (0.59, 0.60 and 0.48) and the three FLC scales (0.67, 0.61 and 0.70) are low but are not dissimilar to published results with scales of other locus of control instruments (Levenson, 1981).

Student responses indicated that there were statistically significant differences between Health and Fitness Locus of Control scores. The mean scores on the Internal HLC and FLC scales showed that this sample of students had a moderate to high internal locus of control for their personal health and physical fitness with the students taking significantly ($t = 6.11$, $p < 0.001$) more personal control for their fitness (mean = 31.04) compared to their health (mean = 27.4). For the Powerful Others HLC and FLC scales the student sample had only a moderate external locus of control; for the HLC scale, grade 8 had a statistically significantly more external locus of control than did grade 9. These students believed that Powerful Others had a significantly ($t = 3.01$, $p < 0.01$) greater control over their fitness (mean = 21.64) than the comparative aspect of health (mean = 19.55). The Chance scale scores on the Fitness LOC (mean = 13.39) were significantly ($t = 7.62$, $p < 0.001$) lower than on the Health LOC (mean = 18.63) reflecting that these students have a higher internal locus of control for fitness and do not consider their fitness is due to chance. The higher mean scores on the internal locus of control scales compared to the other two scales are

consistent with other research work (Levenson, 1981).

Negatively significant correlations (Table 2) between the scores for the Chance Locus of Control scales on both the HLC and FLC Instruments and student Health and Fitness Knowledge scores indicated that students with high knowledge scores have an internal locus of control (lower scores) while those with low knowledge scores have an external locus of control (higher scores).

CONCLUSIONS

The results of this study provide useful information about the condition of health education in Western Australia though the results need to be interpretted cautiously since the low reliability measures of the instrument used in the study could lead to making Type II errors. While this sample of grade 8 and 9 students scored relatively well on several of the true/false items which addressed personal health (nutrition) and physical fitness (exercise) concepts, when reasons for this knowledge were solicited the percentage correct responses for the items dropped considerably and many students' ideas were incomplete, erroneous or were related to a misconception or misunderstanding. Consequently, this study does provide further evidence of students' misconceptions about health and fitness and addresses the concerns of Brumby et al. (1985) about the need to more fully investigate students' understanding of concepts involved in health education.

A relatively high number of students provided erroneous reasons, based on either preconceptions or misconceptions, for making decisions about the falsity or truth of a statement related to their personal health or physical fitness. Certainly students do not come to secondary health education

classes with a 'tabula rasa' since they have acquired knowledge of values through their elementary schooling, through the media and their family. A knowledge of such erroneous reasoning which students bring to the secondary classroom may be useful to classroom health education and science teachers when planning lessons about health and fitness. Further research is likely to identify other areas of student understanding which are not consistent with acceptable scientific knowledge and upon which teaching for conceptual change can focus.

Responses to the Locus of Control instruments showed that on the Internal and Chance scales this sample of grade 8 and 9 students had a higher expectation of control by themselves for their fitness compared to their health. The reverse situation on the Powerful Others scales where the students believed that powerful others had greater control over their fitness compared to their health is difficult to interpret. However, Levenson (1981) explains that empirically one could score high or low on all three scales and that inconsistent findings need to be further investigated for, for example, an acquiescence response set. Such a follow up investigation was not conducted in this study. Levenson (1981) also explains that the psychological meaning of the Powerful Others dimension needs to be explained further since powerful others are often seen as thwarting attempts at mastery and control. Nevertheless, the findings are consistent with the review by Wallston and Wallston (1981, p.217) who write that "Persons engaging in preventative health behaviour show the greatest health internality and the lowest health chance beliefs. They are moderate in belief and in control by powerful others, and do not appear to differ from other adults in this dimension".

The significant correlations between Chance HLC and Chance FLC scores with the Health and Fitness Knowledge indicate that students who possessed

high knowledge scores had a tendency not to believe in chance for their personal health and physical fitness. Conversely, students who possessed low knowledge scores had more of a tendency to believe in chance for their personal health and physical fitness. This relationship may mean that internality of the locus of control construct can be increased through increased knowledge, or increase in the internality of the locus of control construct can help improve knowledge. However, this study has not investigated these relationships and since there were no significant relationships between the Internal and Powerful Others scales with the knowledge scores, the results are difficult to interpret. Of further interest would be to investigate the effect of internality of locus of control and increased knowledge on actual student behaviour concerning their personal health and physical fitness, an area of further research suggested by Wallston and Wallston (1981).

Overall the health education curricula would appear to be achieving some of its intended goals. Students were knowledgeable about many of the concepts which were presented to them though they were often unable to offer explanations for their knowledge in terms of acceptable scientific understanding. However, misconceptions and erroneous explanations were encountered less frequently than in reported research in the science education literature. The spiral nature of the health education curriculum in Western Australia has much to recommend it though at the level at which these questions were asked it was surprising that no differences in achievement or locus of control (with one exception) were detected between grades 8 and 9 students. While grade 9 students have had a full year more of the health education curriculum than the grade 8 students, it may be that the conceptual knowledge instrument did not investigate the extra knowledge learned in that year and hence failed to discriminate any learning

differences. Similarly at the level of schooling the locus of control instruments may not be sensitive enough to differentiate the two groups' locus of control. It would be instructive to administer the knowledge instrument to students upon completion of their elementary schooling (end of grade 7) and upon completion of the grade 10 course in order to ascertain the influence of the lower secondary school (grades 8 - 10) curriculum on students conceptual knowledge and locus of contol of personal health and physical fitness.

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Table 1

Student responses (n = 109) on Health and Fitness Knowledge Instrument showing mean percentage responses correct for the True-False part of each item

Item	Areas Evaluated[1]	Mean % Correct
1	HF	52
2	H	35
3	F	72
4	HF	85
5	HF	95
6	F	72
7	H	66
8	H	62
9	F	89
10	F	75
11	HF	74
12	H	97
13	H	61
14	H	85
15	H	39
16	HF	7
17	HF	67
18	H	51
19	F	50
20	F	75

Note: 1. The areas evaluated were categorized a personal health (H), physical fitness (F) and a combination of health and fitness.

Table 2

Descriptive data on Health Locus of Contol (HLC) and Fitness Locus of Contol (FLC) instruments and intercorrelations with Health and Fitness Knowledge for grade 8 and 9 students (n = 109).

Scale[1]	Mean	s.d.	Cronbach alpha	t-value	Intercorrelation Coefficients with Health & Fitness Knowledge
Internal HLC	27.44	4.62	0.59	6.11**	0.09
Internal FLC	31.04	4.05	0.67		0.03
Powerful Others HLC[2]	19.55	5.13	0.60	3.01*	- 0.14
Powerful Others FLC	21.64	5.12	0.61		- 0.01
Chance HLC	18.63	4.92	0.48	7.62**	- 0.28**
Chance FLC	13.39	5.24	0.70		- 0.36**

* $p < 0.01$
** $p < 0.001$

Notes: 1. Each scale contained six items
2. A statistical difference existed between grades 8 and 9 ($t = 2.44$; $p < 0.05$).